

## When Environmental Issues Collide: Climate Change and the Shifting Political Ecology of Hydroelectric Power

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### Abstract

While the global focus on climate change may substantially increase attention and funding for sustainable development initiatives in general, it may also create newfound conflicts among divergent conservation and development agendas. For instance, climate change appears to be altering the terms of debate concerning the costs and benefits of constructing large dams in ways that remain little analyzed. This issue can be observed in Costa Rica, which recently initiated a major new wave of dam-building, including a large project on the Río Pacuare—an important ecotourism destination and site of substantial biodiversity—in the interest of expanding the capacity of a sector supplying nearly 80% of the nation’s power and widely considered a “clean,” renewable energy source. In response to growing climate change concern, the Costa Rican government has vowed to achieve carbon neutrality by 2021 and reducing emissions is a key component of this plan. On the other hand, ecotourism operators contest the governments’ assertions of the proposed dam’s importance by emphasizing the economic and conservation benefits of a free-flowing river via ecotourism. An increasing critique of ecotourism as a conservation strategy, however, concerns its contribution to climate change through air travel. Thus, in the conflict over the Pacuare River, different models of both conservation and development appear to collide, with biodiversity and climate change on the one hand, and modern and postmodern forms of capitalist development on the other, all competing to define appropriate resource use in the valley.

### Introduction

While and colleagues (2009:2) observe that the global campaign to address anthropogenic climate change has recently become “the new ‘master concept’ of environmental governance,” eclipsing biological diversity conservation as the central organizing principle around which ecological work is undertaken. This increasing focus on climate change has inspired an unprecedented surge in funding for environmental protection and sustainable development initiatives in general, yet it may hold unforeseen and potentially negative consequences for particular environmental issues that are either marginalized within the climate change discussion or that actually run counter to climate change concerns. As While and colleagues (2009:10) observe, “discourses of climate change can be mobilized politically to justify social and technical fixes for states that environmentalists find unacceptable.” The authors point to nuclear power, biofuel production, and population control as examples of problematic policies to which climate change discourse may provide newfound impetus.

In this article, I address another important issue of concern for environmentalists around the globe that appears to be in the process of dramatic reframing by the climate change discussion, namely the construction of hydroelectric dams and their ecological consequences. I describe a recent resurgence in the construction of hydroelectric dams, both large and small, around the world, spurred, in substantial part, by their newfound description as a form of “clean energy” capable of mitigating the greenhouse gas emissions largely responsible for anthropogenic contributions to

global climate change. While this issue has been mentioned in several recent publications (e.g., Lohmann 2009; Finley-Brook and Thomas 2010; Hirsch 2010; Imhof and Lanza 2010; Mäkinen and Khan 2010; Moore et al. 2010; Pittock 2010), it has yet to be systematically analyzed and its full implications explored.

Employing a political ecology framework, I endeavor to articulate the multiple levels at which this issue unfolds, describing the correlation between the circulation of climate change discourse and the resurgence of hydroelectric power at the global level; how this situation has been engaged at the national level within contemporary Costa Rica; and how all of this plays out in contestation concerning dam construction within specific sites in the country, particularly the controversial Río Pacuare in the eastern highlands, where the merits of a major dam proposal have been questioned for more than two decades.

First proposed by anthropologist Eric Wolf in the 1970s (Watts 2000), political ecology emerged as a distinctive school of thought in the 1980s, fusing a focus on human-environment relations characteristic of a human ecology approach with a Marxist concern for the role inequality plays in motivating conflict within international political economy (e.g., Blaikie 1985; Blaikie and Brookfield 1987). In the 1990s, the field expanded and diversified, incorporating, in addition to the dominant Marxist strain, an alternate perspective more influenced by a poststructural perspective grounded, by and large, in the philosophy of Michel Foucault (e.g., Peet and Watts 1996; Watts 2000).

Political ecology thus represents a particular approach to the study of peace and conflict, emphasizing the role of inequality in access to wealth, and the natural resources upon which wealth is based, as one of the principle drivers of the interrelated dynamics of human discord and ecological degradation. In general, however, political ecology differs from environmental security—another perspective that emphasizes the relationship between conflict and natural resources—by focusing on the social relations underlying access to natural resources rather than treating resource scarcity and/or abundance as sources of conflict in their own right, as much of the environmental security literature does (see Peluso and Watts 2001). A characteristic feature of political ecology analysis entails elucidation of the interconnection between the various stakeholders involved in a conflict at different levels or scales—from the regional to the global and the local to the national—that may underlie seemingly spatially-bounded conflicts, as well as contestation among actors at each of these levels (Watts 2000).

I begin by outlining the global debate concerning the merits of large dams, which has emerged over the last several decades and has led to a dramatic downturn in dam construction, as well as their recent resurgence in relation to growing climate change concerns. I then describe recent research questioning whether dams in fact produce the clean energy proponents claim. Subsequently, I describe how this global discourse surrounding dams is playing out within Costa Rica at present, in relation to a widely-publicized bid to become the world's first carbon neutral nation. I document a vigorous new dam building campaign currently underway in the country and its opposition by environmentalists, led, in the case of Pacuare River, by ecotourism providers offering whitewater rafting excursions that would be highly compromised by the construction of a dam. Finally, moving back to the global level once more, I describe how the anti-dam movement is mobilizing to oppose the reframing of dams as a climate change panacea and how this is likely to affect policy concerning both dam construction and climate change mitigation in the future.

## **Of Dams and Development**

Hydroelectric dams have long been one of the mainstays of conventional development policy, promoted throughout the world as a key element of the industrialization that promised to elevate impoverished nations onto the vaunted “ladder of progress” toward First World status (WCD 2000; McCully 2001). Over the past several decades, however, hydro dams have been subject to scathing critique on a variety of grounds, led primarily by grassroots groups of dam-affected peoples and the transnational environmental NGOs, such as International Rivers, that support them (see McCully 2001). In addition to displacing somewhere between 40-80 million people worldwide, frequently failing to deliver predicted benefits (in terms of irrigation, flood control, and electricity production), and tending to significantly overrun initial cost projections, large dams are seen to precipitate a variety of negative ecological impacts, including: the reduction of biodiversity; impeded fish migration; reduced water quality (both in the reservoir and downstream); increased disease (e.g., malaria, schistosomiasis); increased downstream erosion, increased flood danger; and reduced floodplain soil replenishment (Reisner 1986; WCD 2000; McCully 2001).

This critique led to the formation of the World Commission on Dams (WCD), co-sponsored by the World Bank and various NGOs, which in 2000 produced an exhaustive assessment highly critical of large dams and calling for far more extensive planning, consultation, assessment, and mitigation measures to justify their future construction (WCD 2000). In its Executive Summary, the WCD report concluded:

Dams have made an important and significant contribution to human development, and the benefits derived from them have been considerable. [Yet] [i]n too many cases an unacceptable and often unnecessary price has been paid to secure those benefits, especially in social and environmental terms, by people displaced, by communities downstream, by taxpayers, and by the natural environment. Lack of equity in the distribution of benefits has called into question the value of many dams in meeting water and energy development needs when compared with the alternatives (2000:xxviii).

Patrick McCully, Executive Director of International Rivers and author of the classic dam critique, *Silenced Rivers*, calls this report “a thorough indictment of the practices and impacts of the international dam industry,” claiming that it has been “the most important single development of the past five years to impact on the world of dam building and dam resisting” (2001:xix). The International Committee on Dams, Rivers, and People claims similarly, “The World Commission on Dams report vindicates much of what dam critics have long argued. If the builders and funders of dams follow the recommendations of the WCD, the era of destructive dams should come to an end” (in McCully 2001:li).

The WCD report crystallized several decades of vigorous campaigning on the part of anti-dam activists around the world that had led to a dramatic decline in new dam construction. By 2000, according to the WCD, the rate at which large dams were being built worldwide had fallen to less than half of its peak level in the 1970s (WCD 2000), while a number of the most successful dam building companies had either folded or merged with others (McCully 2001). All of this reached the point that McCully, in the introduction to his second edition of *Silenced Rivers*, wrote in 2001, “I believe that public perception of dams is shifting. In many parts of the world, favourable media coverage of anti-dam struggles and arguments is shaking the old belief in dams as shining icons of prosperity and modernity (2001:xvi).” And again: “A new order is emerging for rivers and the people who depend on them, and, despite the fulmination and bluster of the dam industry, an old order will pass (2001:lxiv).”

Now, however, the trend identified by McCully appears to be reversing once more, in large part as a result of the recent surge in global concern for climate change. In the January/February 2010 issue of *Wordwatch*, for instance, Imhof and Lanza (2010) observe,

Following a decade-long lull, a major resurgence in dam construction worldwide is now underway. . . . The dam building industry is greenwashing hydropower with a public relations offensive designed to convince the world that the next generation of dams will provide additional sources of clean energy and help to ease the effects of climate change.

Within climate change discourse, hydroelectric power is widely considered a “clean” source of renewable energy that produces minimal greenhouse gas emissions relative to other electricity-generating mechanisms (e.g., coal and oil). The US Department of Energy, for instance, pronounced as early as 1995, “Hydropower plants produce no carbon dioxide. . .no air emissions at all.” (in McCully 2001:141). Similarly, Zhou and coauthors (2008:1078) more recently claim that (small) hydro “is a renewable energy with zero emissions.”

As a result, the growing focus on mitigating climate change provides a new incentive for those concerned about reducing their carbon footprint to invest in hydropower production.<sup>[1]</sup> McCully himself (2001:141) observed this coming trend in 2001, writing, “The once popular claims of ‘cheap hydro’ are now being replaced by claims of hydro as the answer to global warming.” In 2000, the International Energy Agency Hydropower Agreement produced a report asserting “that hydro projects should receive subsidized loans from aid agencies ‘as a payback of the global community for the protection of nature and the world climate’” (McCully 2001:xxxvii).

This incentive to invest in hydro power is enhanced dramatically by the Kyoto Protocol, particularly its Clean Development Mechanism (CDM), which seeks simultaneously to reduce greenhouse gas emissions among Annex 1 countries and spur sustainable development in less-developed nations. Under the CDM’s provisions ACM0002, the “Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources,” for large projects, and AMS-ID, “Grid connected renewable electricity generation,” for smaller ones, hydroelectric dams can be used as offset projects to compensate for emissions from other industrial sources, on the assumption that dams “reduce or displace fossil energy” (Lohmann 2009:29). As Zhou et al. describe,

With the “Kyoto Protocol” coming into effect, the efforts to reduce green house gas emission are

getting more and more attention, especially the clean development mechanism (CDM) activities that are being carried out quickly. As the SHP [small hydro power] is a renewable energy with zero emissions, the CDM market will provide new opportunity to SHP development in the future (2008:1078).

As an example of the use of the CDM to fund hydropower development, Bumpass and Liverman note that:

the El Canada hydroelectric project in Guatemala used the World Bank Prototype Carbon Fund to channel investment from the Kyoto Protocol signatories Canada and the Netherlands to a local company (Generadora de Occidente) that was replacing fossil fuel with hydro-generated electricity at a rate of about 100,000 tCO<sub>2</sub>e per year (2008:14).

Indeed, hydro dams currently comprise the single largest project type in the CDM portfolio (Mäkinen and Khan 2010). As of June 6, 2010, according to International Rivers' database, 1452 projects, with an electricity capacity of 58,770 MW, were either registered or had applied for registration under the CDM. Of these, 707 (52,624 MW) were large projects (greater than 15MW in the CDM's definition). Of the hydro projects currently registered, 157 were receiving certified emissions reductions (CERs) in the amount of 19,676 million tCO<sub>2</sub>e (tons carbon dioxide equivalent).<sup>[2]</sup>

This use of the CDM to fund hydro dam construction may expand dramatically in the near future. Lohmann (2009:30-1), for instance, observes,

In the mountainous river valleys of Uttranchal, India. . .scores of dam projects [stand] in line to be part-financed through selling carbon credits to Northern industry . . . In China, 763 hydroelectric dams have applied or are planning to apply to the United Nations to be allowed to sell more than 300 million tons of carbon dioxide pollution rights to Northern industry through the Kyoto Protocol's Clean Development Mechanism.

Zhou and colleagues (2008) calculate China's total potential small hydropower offset potential at approximately 18.9 million tCO<sub>2</sub>e, with about 3.15 million tCO<sub>2</sub>e to be added each year due to new projects, and suggest, "Based on the above estimation, before 2012, the annual newly built SHP projects will bring 40.95 million US dollar revenues from CERs. By 2012, the annual CERs' revenues will increase to 245.70 million US dollars, facilitating the entire SHP development in China" (Zhou et al. 2008:1082). The Obama Administration recently committed the United States to increase hydropower production as part of the nation's low-carbon development plan, a move praised by the International Hydropower Association<sup>[3]</sup> a global industry advocacy group, which also recently issued a press release highlighting the importance of both the CDM in hydropower development and hydropower in the CDM portfolio, and "calling upon governments to raise the importance of the CDM in their agendas."<sup>[4]</sup> In addition to direct funding as CDM offset projects, hydro dams may receive indirect funding as well due to their ostensive contribution to reducing a nation's total carbon emissions, a dynamic that can be used to generate and channel funds by nations selling overall emissions reductions to foreign parties looking to compensate for their own excessive emissions.

The major new source of funding for hydropower production provided or anticipated by the CDM may be one of the main factors giving new life to dam building around the world. As McCully noted in 2001, one of the chief reasons for the decline in hydro dam construction in the 1990s was lack of available funds. He observed:

Money is needed, lots of money, and the industry is currently having major trouble getting its hands on it. The World Bank, long the single biggest funder of the international dam industry, is retreating from its critics and has cut the number of dams it is funding to well under half of its peak level. Funding from other multilateral development banks and national development agencies is also declining. . . Faced with a funding crisis, the industry is desperately looking for justifications for public subsidies. The great hope for the industry is that global warming will come to the rescue—that hydropower will be recognized as a 'climate-friendly' technology and receive carbon credits as part of the international emissions trading mechanisms under the Kyoto Protocol (2001:xvii).

And indeed, this is precisely what appears to be occurring at present. Imhof and Lanza (2010) observe that much of the new wave of dam building is

driven by infusions of new capital from China, Brazil, Thailand, India, and other middle-income countries. In particular, Chinese financial institutions have replaced the World Bank as the largest funder of dam projects globally. Chinese banks and companies are involved in constructing some 216 large dams. . . in 49 different countries, particularly in Africa and Southeast Asia, many with poor human rights records.

Similarly, McDonald et al. (2009) document Chinese involvement in at least 93 major overseas dam projects. Much of this renewed Chinese interest in dam building is fueled by the promise of CDM funding. According to International Rivers, 936 (37,677 MW) of the hydro projects up for funding under the CDM, representing 60.7% of the total, are located in China (including 503—71.15% —of all large projects).[\[5\]](#)

In addition to providing vital new funding, climate change seems to be shifting the moral discourse surrounding hydro dams as well. As While and colleagues (2009:10) observe, “climate change discourse has a powerful moral imperative, especially when it intersects with questions of national security.” Whereas previously hydro dams were cast by their opponents as an immoral blight on the social and environmental landscape (e.g., McCully 2001), in contemporary climate discourse dams are recast as the moral alternative to fossil fuel-based electricity production. Thus, anti-dam activists may be losing much of the moral foundation upon which their critique has been based in the past as well.

### **Clean Energy?**

The claim that hydro power constitutes “clean” energy, while still prominent in popular media, has been increasingly called into question in recent years. An important factor overlooked in such pronouncements, critics claim, is the release of greenhouse gases (primarily methane) from the vegetation submerged beneath a dam’s catchment reservoir. In an article bluntly titled “Why Hydropower is Not Clean Energy,” for instance, prolific dam critic Philip Fearnside (2007) documents extensive methane production by several large dams in Brazil (see also Fearnside 2002, 2004, 2005a, 2005b, 2006; also Mäkinen and Khan 2010). While a minority of this methane is produced directly by the standing reservoir, far more is released when the reservoir water is released downstream through turbines and floodgates (Fearnside 2005a), and still more escapes when reservoirs are drawn down during low water periods and submerged vegetation becomes exposed (Chen et al. 2009; Qui 2009). Evidence suggests that reservoirs in tropical areas produce far higher emissions than boreal ones (Fearnside 2005a); McCully (2001:xxxvi), for instance, claims “the warming impact of a modern gas plant is between five and eight times more than that of a high-emitting boreal reservoir, but that a tropical reservoir can have a warming impact up to sixty-six times greater than that of a gas plant.” A recent study concludes, indeed, that dams and reservoirs are the single largest source of anthropogenic methane emissions, accounting for nearly ¼ of the global total, amounting to a worldwide annual production of 104 million tons and comprising 4-5% of all human-caused climate warming effects (Lima et al. 2008).

Compounding this are numerous other means by which hydro dams may contribute to greenhouse gas emissions. As McCully summarizes,

A comprehensive accounting of a dam’s contribution to global warming should also include the emissions from the fossil fuels used during dam construction, those from the production of the cement, steel and other materials used in the dam, and, probably more significantly, the changes in greenhouse gas fluxes due to the land use and other changes which the dam encourages, such as deforestation, the conversion of floodplain wetlands to intensive agriculture, the adoption of irrigation on once rainfed lands, and the increased use of fossil-fuel-based artificial fertilizers (2001:145).

Many dams have detrimental impacts on biodiversity as well, due to the habitat inundated by their reservoirs. Goldman, for instance, writes of a major dam project on the Mekong River in Laos:

The site of the Nam Theun 2 dam, watershed, and reservoir happens to house one of the most biologically diverse forests in the world, and was once listed for global protection by the World Bank’s Global Environmental Facility (GEF). Aside from being a propitious site for a dam, the region (especially the newly designated NNTCA or catchments area) hosts an amazing array of diverse and apparently rare animal and plant species, some of which are, according to the latest commissioned studies, at risk of global extinction (2004:505-6).



Given all of this, the claim that hydropower represents clean energy and its use to offset emissions from other sources appears as an exemplary case of what Scott (1998) describes as the type of “simplification” by means of which complex phenomena are reduced to common, easy-to-understand measures so that diverse phenomena can be rendered equivalent and therefore “legible” to a single central authority. So long as the auxiliary energy costs of, and greenhouse gases produced by, hydropower production are externalized, the activity appears to reduce one’s total carbon footprint. If these hidden costs are exposed and internalized, however, the ostensive benefits of hydropower may disappear. Indeed, far from reducing carbon emissions, hydro power may actually in some cases augment them.

### **Costa Rica: At Peace with Nature?**

The implications of the newfound promotion of hydroelectric dams in the service of climate change mitigation are evident in Costa Rica, where a majority of the nation’s electricity supply is produced by hydro dams (and other forms of “renewable” energy), a fact often included as evidence of what many consider the country’s impressive environmental achievements (Evans 1999). Prior to 1980, Costa Rica indeed obtained all of its electricity from hydro; in the 1980s, this number dropped to 90%, with an additional 8% coming from other forms of “renewable” energy such as geothermal and wind (WCD 2000; McCully 2001). By 2004, hydroelectric production had dropped to 80% of the total, with a total of 99% produced by “renewables” (16% geothermal, 3% wind) and only 1% from fossil fuel combustion (ICE 2006:16). The latest report produced by the National Electricity Commission (ICE) claims that hydro currently (as of December 2008) constitutes 78.8% of the nation’s total energy supply, with an additional 14.4% produced by other “renewables” and the remainder (7.2%) coming from fossil fuels (ICE 2009:23).

At present, the country’s electricity demand is increasing 6% per year, according to ICE’s calculations, and is predicted to nearly triple by 2025 (ICE 2006). In order to meet this rapidly increasing demand, ICE, which holds a virtual monopoly on electricity production domestically (a small percentage is produced privately),<sup>[6]</sup> has developed an ambitious expansion plan with 53.3% of new capacity to come from hydro (an additional 38.3% from fossil fuels and 8.2% from geothermal and wind projects) (ICE 2006).<sup>[7]</sup> The government hopes to sell excess capacity as an additional revenue source to other regional nations as well in the emerging Central American Electricity Market (ICE 2009). ICE has identified a total of 6474 MW of hydropower generation potential nationwide, only 23% of which is currently being exploited (ICE 2009:41).

Climate change policy appears likely to increase Costa Rica’s emphasis on hydropower dramatically in the near future. In 2007, former President Oscar Arias made international headlines by vowing to make Costa Rica carbon neutral by 2021 (the nation’s bicentennial), an initiative termed *Paz con la Naturaleza* (Peace with Nature) (see Fletcher forthcoming). The National Climate Change Strategy (NCCS), subsequently created to meet this ambitious goal, emphasizes both mitigation and adaptation measures (Dobles 2008). In terms of mitigation, the NCCS calls for emissions reductions in all sectors of the economy, combined with carbon capture and storage, primarily through the nation’s extensive system of rainforest protected areas and privately owned reserves. In order to finance this ambitious proposal, which is estimated to cost on the order of US \$7 billion dollars (with an equivalent amount to be invested in a new high-speed rail system), the government is seeking to sell its reduced emissions as offsets to high-emitting Northern countries, expanding upon the nation’s highly successful payment for environmental services (PES) program that already sells carbon credits to several European nations under the CDM and similar European Trading Scheme (ETS). As the NCCS clearly states,

In order to implement the strategy, an access to new and additional financial resources is required, including official funds, concessions toward developing countries, and carbon markets. Appropriate financial instruments and carbon markets provide effective incentives for developing countries (Dobles 2008:20).

At present, however, the main push of the NCCS has been merely to compensate for continuing emissions in other sectors (e.g., transportation) through increased sequestration by preserving forests and reducing deforestation and degradation (a strategy known as REDD). With so much of its energy produced by ostensibly “clean” sources, there has been little attempt to date to address the means by which energy is produced. As a so-called “renewable,” zero-emission source of energy, hydropower can contribute dramatically to Costa Rica’s effort to demonstrate neutrality in terms of the ratio between carbon release and sequestration. As ICE (2009:21) states in support of its dam-building program, “Renewable energy sources provide the double function of reducing dependency on petroleum and permitting clean and sustainable development.” Indeed, without designating hydro—upon which the

nation's energy supply fundamentally depends—"clean" energy, it is highly unlikely that Costa Rica would have even the slightest chance of achieving its carbon neutrality goal (a prospect many consider dubious at any rate—see Fletcher [forthcoming]).

Partly in response to the government's carbon neutrality campaign, ICE has recently embarked upon a renewed push to construct a number of hydroelectric dams throughout the country, which ICE explicitly pronounces part of "the national political agenda of reducing dependency on fossil fuels and greenhouse gas emissions" (ICE 2009:3, 69). In addition to several projects already near completion, ICE has proposed a series of seven major new dams, with a total generating potential of 1440 MW. At least three of these projects—on the Río Reventazón, in the eastern highlands; on the Río Savegre, near the central Pacific Coast; and on the Río Grande de Térraba in the far south—have already been initiated. This last project, named El Diquís, 170 meters in height with a projected generating potential of 631 MW, would be the largest hydro dam in Central America to date (more on this below).[\[8\]](#)

Dam construction has a long and controversial history in Costa Rica. Since 1958, 15 large dams and numerous small ones have been built throughout the country, with a total generation potential of 1511 MW (ICE 2009:63). Yet this dam building effort has at times been met with fierce internal opposition that has halted several large projects in their tracks. A 167 MW project first proposed in the 1980s for the Río Pacuare (just south of the Reventazón in the eastern highlands), currently undammed and an important source of tourism revenue via whitewater rafting (the river is world-renowned for this activity), was officially suspended in 2005 as a result of decades of sustained protest and concerns regarding the validity of ICE's environmental impact assessment. In the same period, the infamous Boruca project in southern Costa Rica, which would have been by far the largest dam in Central America with a generating capacity of 832 MW and a height of 230 meters, was halted after more than 30 years of planning and negotiation due to opposition from a coalition of indigenous peoples who would have been displaced by the project and their international supporters (Carls and Haffar 2010).

### **River People**

One of the main stakeholder groups impacted by the prospect of future dam construction in Costa Rica and elsewhere is composed of ecotourism operators selling whitewater rafting excursions. Whitewater paddlers have long been at the forefront of anti-dam struggles in various parts of the world. In California, for instance, paddlers in the 1970s fought (unsuccessfully) to stop the major New Melones dam on the Stanislaus River in California, then the most popular commercial whitewater run in the United States, an action that led to the formation of the Sacramento-based NGO, Friends of the River, which campaigns against dam construction throughout the state (Palmer 1984). Similar campaigns are led by the NGO, American Whitewater, a coalition of whitewater paddlers, on a nationwide scale. In South America, whitewater operators contributed to the (equally unsuccessful) effort to halt a series of large dams on Chile's Río Biobío (Fletcher 2001), then considered one of the premiere whitewater runs in the world, and paddlers continue to lead the charge to stop another series of dams intended for the equally-renowned Futaleufú River in Chilean Patagonia (Fletcher 2009).

Similar opposition to dam-building by whitewater paddlers has occurred in Costa Rica as well. Tourism is big business in Costa Rica; Honey (2008:160) calls Costa Rica "ecotourism's poster child." Tourism comprises one of the country's largest sources of revenue, generating 20-22% of total foreign currency and 7-8% of the nation's GDP (Honey 2008:164). Nature-based excursions such as whitewater rafting comprise at least 60% of this total, and just over 9% of all visitors claim to have participated in rafting trips specifically (Honey 2008:161). As noted earlier, in the 1980s ICE began to explore the possibility of constructing a 180-meter dam on the Río Pacuare—widely considered *the* premiere whitewater run in Central America and among the top ten in the world (Blake and Becher 2006:123)—officially announcing the intention in 1996. Opposition from paddlers, both domestic and foreign, as well as members of local communities that would have been impacted, compounded by a questionable environmental impact assessment and concerns about both the structural integrity of the dam site and loss of the biodiversity-rich rainforest in the surrounding watershed, successfully forestalled the project for many years, until it was officially suspended in 2005.

Despite corresponding action on the part of paddlers, however, another hydroelectric dam—the Angostura project—was completed in 2000 on the nearby Río Reventazón. This dam has had a substantial impact on Costa Rica's whitewater industry. Prior to the dam's construction, the Reventazón contained the only beginner (Class II-III)[\[9\]](#) run in the area and was the main source of all operators' business. The demand for this and other runs was such that professional raft guides from around the world were drawn to Costa Rica during the industry's high season

between December and April (when the northern hemisphere was deep in winter), most residing in the nearby town of Turrialba, two hours due east of the capital San José. In addition, a far more difficult (Class V) section just downstream of the dam site attracted expert kayakers from around the world as well. Moreover, several national Olympic kayak teams (e.g., France, the US) would regularly arrive for several months each year to reside in Turrialba and train on the Reventazón during the northern hemisphere's winter. Finally, a popular intermediate (Class IV) section on the Reventazón, frequently run before the dam's construction, now tends to flow at such a high level due to outflow from the Angostura dam that it is attempted only rarely by most outfitters.

The completion of the Angostura project has negatively affected Turrialba's economy. Many domestic operators, previously based in Turrialba, have relocated their facilities several hours east to Siquirres, to the remaining intact whitewater section on the Pacuare. And most of the annual influx of foreign paddlers—coming to work in the whitewater business or to paddle more difficult sections of the river—has disappeared.

The decline in whitewater-related business and tourism has only reinforced the progressive marginalization that Turrialba has suffered for some time now. Once the major population center on the only road between San José and the Caribbean Coast, the town was bypassed by the construction of Costa Rica's new Caribbean highway in the late 1980s, and in 1991 the so-called "Jungle Train," which passed through Turrialba as it traced the length of the Reventazón to the Caribbean Coast, was disabled by an earthquake and never rebuilt. With the recent impact on tourism precipitated by the Angostura project, therefore, Turrialba, previously considered the ecotourism capital of the country, has been displaced still further.

With the loss of the Reventazón runs, Costa Rica's whitewater industry has come to rely almost exclusively on the remaining Pacuare section (with smaller operations in various other parts of the country, including Guanacaste, Arenal, and Quepos). The struggle to halt the dam designated for the Pacuare led to the river's distinction as "the first Central American river to be accorded 'wild and scenic' status" (Cassady and Dunlap 1999:166), a category created in the US that precludes human development within a river corridor. In addition, a portion of the watershed's southern flank contains a federally-protected indigenous reserve, the Alto Chirripo (Evans 1999). Moreover, there is an effort underway to make the area into a national park (Blake and Becher 2006:123).

Despite all of this, whitewater operators remain concerned that ICE will resume its drive to dam the Pacuare as Costa Rica's electricity demands continue to grow apace with the country's industrialization. As paddlers and dam opponents Mayfield and Gallo admit of the Pacuare site,

The narrow gorge at Dos Monta-as is, no doubt, the dam builder's dream. Through this narrow cleft flows a river with a large, dependable flow (average of 2200 cfs [cubic feet per second]) and the gorge provides an ideal dam site. Completion of this project would, no doubt, supply a number of jobs during construction and a valuable commodity afterwards (1988:81).

Further, Cassady and Dunlap (1999:166) observe that the Pacuare's "wild and scenic" status "does not necessarily assure protection from previously enacted rights of the national utility company to tap hydro power." Thus, ongoing efforts are underway to organize in opposition to the potential dam, including outreach to the indigenous people living along the river, who—one outfitter claimed—will likely form the lynchpin of any future anti-dam effort, as their reserve holds the highest level of protection of all land within the watershed.

And indeed, several signs point to ICE's strong interest in resuming the Pacuare project in the near future. Although the project is not officially listed among those proposed for development prior to 2021 in ICE's most recent expansion plan (ICE 2009:2; Table 1.1.), elsewhere in the same document it is referenced repeatedly. For instance, the Pacuare project is explicitly included along with the already-initiated Reventazón, Diquís, and Savegre projects as one of "the largest hydroelectric projects" needed "to advance the national political agenda of reducing dependency on fossil fuels and greenhouse gas emissions" (ICE 2009:3, 69). Further on, the project is included on ICE's list of "candidate projects" and even given a projected completion date of October 2016 (ICE 2009:71). The project is also listed on one (#5) of ICE's seven proposed energy development plans (ICE 2009:95). It is included on ICE's map of project and plant locations (ICE 2009:141) as well.

### **Contesting Commodification of Water**

I do not wish to portray contestation concerning dam building on the Río Pacuare as a situation in which the noble environmentalist paddlers bravely confront the evil capitalist developers, however, for whitewater paddlers clearly



seek to exploit the Pacuare as a form of capital accumulation as well. A number of researchers have recently pointed out that ecotourism is itself a capitalist industry that functions by commodifying in situ natural resources (West and Carrier 2004; Duffy 2008; Brockington et al. 2009; Fletcher 2009). In this respect, ecotourism is part and parcel of what O'Connell (1994) labels capitalism's contemporary "ecological phase," which seeks to internalize natural resources as an integral component of the production process to be rationally managed for sustainable long-term use rather than externalizing such resources as an expendable input, an approach characteristic of the preceding industrial era. In this sense, ecotourism can be viewed as a form of postfordist, postindustrial—that is, postmodern—capitalist accumulation (Harvey 1989; Mowforth and Munt 2003). Hence, rather than viewing paddlers as selfless activists heroically defending the environment, one can highlight the self-interest involved in their efforts, as the damming of rivers in pursuit of hydro power threatens the natural resource upon which whitewater operators' livelihood depends. And indeed, operators opposing the Pacuare hydro project self-consciously acknowledge this dimension of the conflict. As Rafael Gallo, owner of Rios Tropicales, Costa Rica's largest whitewater company, states, the proposed dam threatens "some 500 jobs directly related to tourism and at least another 2,000 secondary jobs."<sup>10</sup>

Thus, the opposition between whitewater paddlers and dam builders might be understood not as a conflict between capitalism and conservation but rather as a conflict between two different efforts to commodify water within two different regimes of capital accumulation, modern and postmodern, industrial and postindustrial (Brockington et al. 2008). Yet within the framework of climate change discourse, dam builders are attempting to transcend this opposition, framing hydro dams as themselves a form of "ecological capitalism" that serve to conserve resources for long-term sustainability. Goldman describes this in relation to the Nam Theun 2 project, in which

the World Bank and its partners are linking hydroelectric dam and transmission financing to an ambitious string of conservation and protected areas, megafauna running corridors, watershed conservation sites, eco-tourism projects, biodiversity research and development sites, and indigenous peoples' extractive reserves (2004:506).

As a result, the Bank has enlisted a number of major conservation NGOs, including the World Conservation Union (IUCN), Worldwide Fund for Nature (WWF), and Wildlife Conservation Society (WCS), as collaborators in the project. As Goldman observes of this collaboration,

The environmental projects are the legitimizing vehicle for the dam: Without such a strong public commitment to environmentally sustainable development, the World Bank and its counterparts would not be able to proceed without incurring robust resistance from the highly effective campaigns to stop "traditional" World Bank-style developmentalism. In effect, the Bank's pro-active response to transnational environmental organizations, networks, and movements are new strategies of global environmentalism that have become institutionalized (with greater and lesser effectiveness) throughout the world (2004:507).

As a result of such efforts, in rare cases, hydro dams may indeed contribute to rather than detract from biodiversity preservation on aggregate. Indeed, as Goldman (2004:517) notes, it is in dam builders' interest to invest in protecting "the natures that will support capital investments—such as forested mountainous terrain that can act as a watershed buffer for the hydroelectric dams." In Costa Rica, ICE has engaged in just this strategy, acquiring control of parcels in the watersheds above some of its hydro projects in order to engage in reforestation efforts to reduce siltation and increase projects' life. ICE manages a substantial conservation area, for instance, in the watershed surrounding its major Arenal project in the north of the country (Vivanco 2006).

Yet even in this, the social costs may outweigh the conservation benefits of such efforts. As Imhof and Lanza (2010) contend of the Nam Theun 2 project,

Rather than being a new model of hydropower development, the experience with Nam Theun 2 to date only reinforces lessons learned from other large hydropower projects around the world. Instead of giving hope for the future, Nam Theun 2 threatens more of the same: broken promises, shattered lives, ruined ecosystems.

Finley-Brook and Curtis Thomas (2010) find similar social concerns with large dams throughout Central America, which are often praised for their ecological benefits.

In addition to providing new support for dam builders' actions, climate change hegemony may be weakening ecotourism operators' position in the debate over appropriate water use. One of the principle attributes of ecotourism commonly celebrated by proponents concerns its contribution to biodiversity protection through ascribing economic value to in situ natural resources and thus providing an economic incentive for their preservation (Honey 2008). One of ecotourism's central criticisms, on the other hand, increasingly leveled of late, is its contribution to climate change due to the greenhouse gas emissions from long-haul air transport, upon which the industry fundamentally depends (Carrier and Macleod 2005). Hence, the recent displacement of biodiversity by climate change as environmental governance's new master concept threatens ecotourism's claim to contribute a net benefit to conservation goals—while dams, paradoxically, have gained newfound support from this shift for their ostensive environmental benefits.

## Conclusion

In the conflict over the Río Pacuare in Costa Rica, then, different models both of conservation and of development appear to collide, with biodiversity and climate change, on the one hand, and modern and postmodern forms of capitalist development, on the other, all competing to define appropriate resource use in the valley. This situation, I have argued, is indicative of overarching changes in the valuation of large dams in general and propelled, in substantial part, by increasing concerns over the consequences of anthropogenic climate change. In the new climate change-based framework, hydro dams are seen not as a regrettable ecological disturbance necessary for national development—as they were commonly construed in a previous era—but rather as an ecological force in their own right. This dynamic, I have shown, is becoming increasingly prominent in Costa Rica, as the nation strives to achieve carbon neutrality and relies fundamentally upon hydropower to do so.

In sum, the terms of debate concerning the merits of constructing hydroelectric dams seem to have been fundamentally altered by the growing hegemony of climate change as the central organizing principle of environmental discourse and policy. If the Río Pacuare hydroelectric project is reinitiated in the future—which appears likely as Costa Rica's campaign for carbon neutrality moves forward and domestic power demands increase as predicted—clearly one of its major points of justification will be its contribution to climate change mitigation, as ICE's explicit mention of the project's role in “reducing dependency on fossil fuels and greenhouse gas emissions,” cited above, makes readily apparent. In the current climate of climate change hegemony, resistance to dam projects seems to be becoming much more difficult due to both the policy and moral force that they now hold as an agent of climate mitigation.

Perhaps due to this newfound reality, Costa Rica's once-strong anti-dam movement seems to be eerily silent in relation to the various hydro projects currently under construction. The massive Diquís project, for instance, which has been proposed to replace the moribund Boruca mega-dam, appears to be moving forward with virtually no public resistance (at the time of writing, the project was in the final phase of environmental impact assessment, slated to break ground in 2012 and come online in 2016) (ICE 2010). To its credit, ICE has made substantial efforts to learn from its Boruca failure by engaging in an extensive, at least superficially participatory, process of needs assessment and satisfaction for the approximately 1000 residents who will be displaced by the project (none of whom, ICE claims, are indigenous peoples) (ICE 2010). Hence, Carls and Haffar (2010:113), while critical of the defunct Boruca project, claim, “The design of the smaller project El Diquís offers many advantages in comparison to the Boruca option as far as the size of the area flooded, relocation of people, environmental impacts, number of archaeological sites affected, and finally the costs involved.” Perhaps echoing to a degree the Nam Theun 2 collaboration described above, The Nature Conservancy has already started soliciting the Costa Rican government to finance conservation efforts on watersheds feeding the future Diquís reservoir, as part of the organization's innovative new policy to promote “water funds” designed to transfer payments for environmental services from downstream users to upstream conservers (Benítez et al. 2010).

Likewise, a second large dam currently in construction on the Reventazón has encountered no organized opposition from either local communities or the whitewater paddlers active in the nearby Pacuare protests. As one raft guide explained to me, many paddlers already consider the dam as good as built (despite the fact that there is no actual structure yet) and are concentrating their efforts on the Pacuare, which, unlike the Reventazón, enjoys a substantial level of federal protection.

The hegemony of climate change discourse is such that even critics of conventional development policy may promote hydropower development as a component of their critiques. In Costa Rica, for instance, a group of young

professionals calling themselves “co2neutral2021” has organized to decry the government’s dearth of substantive efforts to actually achieve the carbon neutrality that is its stated goal. In their critique, however, the co2neutral2021 group embraces hydro’s clean image, contending, “Despite the sharply increased demand, Costa Rica has the ability to satisfy the increased electricity demand with 100% renewable energy. Costa Rica has the potential for an additional 8,500MW of wind, geothermal, and hydroelectric capacity.” [\[11\]](#)

In response to all of this, the anti-dam movement has reframed its efforts and begun to mobilize in order to counter the dam building industry’s self-promotion of hydroelectricity as climate-friendly power. International Rivers, for instance, has devoted a substantial portion of its web space to critiquing the presentation of hydro dams as clean energy producers, asserting:

River-wrecking dams are the wrong choice for a warming world. . . International Rivers seeks to prevent big hydro developers from exploiting the CDM’s flaws, to fix the CDM’s worst loopholes, to exclude the CDM and reduce the amount of offsets in US climate legislation, and to promote better mechanisms for supporting decarbonization. [\[12\]](#)

The site contains links to various articles with titles such as: “Bad Deal for the Planet: Why Carbon Offsets Aren’t Working...and How to Create a Fair Global Climate Accord;”[\[13\]](#) “The Great Offset Swindle: How Carbon Credits are Gutting the Kyoto Protocol and Why They Must Be Scrapped;” and “The CDM’s Hydro Hall of Shame.”[\[14\]](#) Various promotional videos critiquing hydropower (e.g., “Hydropower: Not as Clean as You Think”[\[15\]](#)) are also available for viewing, including several YouTube clips featuring Executive Director McCully himself.[\[16\]](#) Other pages are devoted to critiquing the merits of specific hydro projects that have applied for CDM registration—for example, the controversial Changuinola 1 megaproject (see Finley-Brook and Thomas 2010) currently underway in Panama.[\[17\]](#)

Such efforts have contributed to limited acknowledgment of the issue on the part of several international bodies, including, recently, both the CDM Executive Board and the Intergovernmental Panel on Climate Change (IPCC), and, even earlier, the WCD itself in its famous 2000 report (Mäkinen and Khan 2010). Despite such acknowledgement, however, Mäkinen and Khan (2010:95) observe that the international community continues to display “relatively little awareness of the issue and it has not entered mainstream discussions of GHG emissions and climate change.” Consideration within policy fora has been still less evident (Mäkinen and Khan 2010).

Hence, whether anti-dam activists’ efforts will ultimately be sufficient to counter the dam builders’ campaign to sell hydro as a global warming solution remains to be seen. Mäkinen and Khan (2010:101) predict that “[a]s scientific knowledge accumulates and becomes more robust, national and global accounting of GHG emissions from water reservoirs is likely to become mandatory.” Similarly, the authors assert,

An independent, credible global body such as the UN system should be called upon to assess scientific information available through published literature, and to commission additional research to fill in the missing gaps. The issue of reservoir emissions needs to cover the full spectrum of the uses of dams using well established climate change policy principles embodied in the UNFCCC (Mäkinen and Khan 2010: 103).

Likewise, Pittock (2010:450) calls for “more rigorous climate-change policies that limit the perverse impacts of incentives for hydropower.” Concrete steps in the directions advocated by these authors, however, have yet to be initiated. Thus, how such proposals will affect the dam builders’ claim to mitigate climate change, and increasing support for this claim within the international conservation community—as well as how proponents of ecotourism’s use as a conservation strategy will engage with the growing critique of the industry’s own implication in greenhouse gas emissions—remain important questions for the future, to which subsequent research and policy advocacy should be devoted.

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## Footnotes

[1] While hydropower generation is thus intended to influence climate change, research suggests that future climactic variation will impact hydropower generation as well, due to new fluctuations in precipitation levels affecting river flows—and thus generation potential—that climate changes will likely engender (see e.g. McCully 2001:xxxvii-iii).

[2] [internationalrivers.org](http://internationalrivers.org); accessed 6/7/10.

[3] [abanet.org](http://abanet.org); accessed 6/7/10.

[4] [hydroworld.com](http://hydroworld.com); accessed 6/7/10.

[5] [internationalrivers.org](http://internationalrivers.org); accessed 6/7/10.

[6] This is slated to end when the recently-signed Central American Free Trade Agreement (CAFTA) goes into effect in the near future.

[7] This is the most optimistic assessment; other forecasts predict as much as 50% fossil fuel production (ICE 2006).

[8] [grupoice.com](http://grupoice.com); accessed 3/23/10.

[9] Whitewater is commonly rated on a six-point scale, which the International Canoe Foundation defines as follows:

Class I. Moving water with a few riffles and small waves. Few or no obstructions.

Class II. Small-scale rapids: waves up to 3 feet; wide, clear channels that are obvious with some maneuvering required.

Class III. Rapids with high, irregular waves, narrow passages often requiring complex maneuvering.

Class IV. Long, difficult rapids with constricted passages often requiring precise maneuvering in very turbulent water. Scouting from shore often necessary. Conditions make rescue difficult. Decked boaters should be able to eskimo roll.

Class V. Extremely long, difficult, very violent rapids with highly congested routes. Rescue conditions are difficult, and a mishap means considerable hazard to life. Ability to eskimo roll essential.

Class VI. Difficulties of class V carried to extreme. Nearly impossible and very dangerous. For teams of experts only, at favorable water levels and with all precautions. (cited in Holbeck and Stanley 1998:333)

[10] [adventure-life.com](http://adventure-life.com); accessed 3/23/10.

[11] [co2neutral2021.org](http://co2neutral2021.org); accessed 3/23/10.

[12] [internationalrivers.org](http://internationalrivers.org); accessed 3/23/10.

[13] [internationalrivers.org](http://internationalrivers.org); accessed 3/25/10.

[14] [internationalrivers.org](http://internationalrivers.org); accessed 3/25/10.

[15] [internationalrivers.org](http://internationalrivers.org); accessed 3/25/10.

[16] [internationalrivers.org](http://internationalrivers.org); accessed 3/25/10.

[17] [internationalrivers.org](http://internationalrivers.org); accessed 3/25/10.

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